



FACTORS THAT INFLUENCE TEACHERS CHOICE OF STRATEGIES IN TEACHING CHEMISTRY IN SECONDARY SCHOOLS

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ABSTRACT

This study was carried out with the aim of identifying the factors that influence the use of teaching strategies by chemistry teachers in Ebonyi state secondary schools. Two research questions guided the study, two hypotheses were stated and tested at 0.05 level of significance. The population of the study comprised all the 210 chemistry teachers. The instrument used for the data collection was a closed response questionnaire developed by the researcher and validated by 3 experts, it was pilot tested and it yielded alpha value of 0.90. The data analyses were done using mean, Z-test and one-way analysis of variance. The results showed that all the 25 factors studied influenced the use of teaching strategies. It was observed that there is significant difference between the responses of the male and female chemistry teachers on thirteen items, while inter-zonal differences were also observed among teachers in the 3 education zones of the state. The researcher made the following recommendations based on the findings. The chemistry teachers and indeed all the science teachers should be encouraged to go for information communication technology training, more chemistry teachers should be employed to enhance the performance of students in the subject, both the state government and the ministry of education should build more classroom blocks and provide enough furniture and other necessary equipment in the school, among others.

Introduction

Ebonyi State was created in 1996; it was carved out of two states (Abia and Enugu) on the 1st of October, 1996. It is located within the South-East zone of Nigeria, with a population of about 3 million people (NPC, 2000). Ebonyi state is endowed with abundant natural resources including solid mineral deposits, fertile arable land, water and sea food and favourable climatic conditions. Most of the people of Ebonyi state are farmers. The state is one of those states in Nigeria classified by the Federal Government as Educationally Disadvantaged.

The government of Ebonyi state and other stakeholders in the Education industry have great desire for entrepreneurial education and they do everything to encourage it. There are 3 Education zones in Ebonyi state namely; Abakaliki, Onueke and Afikpo Zones. According to Ebonyi State Secondary Education Board (EBSEB, 2014), there are 221 Government owned secondary schools in the state. Chemistry is among the subjects taught in all these schools. Whereas entrepreneurial education requires that students be taught the adequate knowledge and skills needed to perform on the job and most importantly to be self-employed, the attainment of the objectives of entrepreneurial and vocational education cannot be accomplished without adequate teaching strategies (Olaitan, 2003, Obi, 2009 and Omiko, 2014).

The teaching of chemistry in Ebonyi state for skill acquisition and development of entrepreneurial attitude in the students has not been very effective; its major problem was identified as inadequate entrepreneurial and vocational preparation on the part of the graduating students (Omiko, 2012). A good and quality chemistry education is supposed to prepare students for science career or chemistry-related careers (Njoku, 2009), in addition to a sound academic qualification.

The strategies used in teaching chemistry by the chemistry teacher have been identified (Agbudu, 2008, Obi, 2009, and Omiko, 2014). Teachers' choice of strategies to be used in teaching chemistry is influenced by a number of social and economic factors which in turn influence their productivity. Omiko (2014), observed that the working conditions and the general work environment influence the attitude of teachers. Njoku (2009) observed that the working conditions of science teachers and the world view affect teachers' productivity. The aim of this study was to examine and specifically identify the factors that influence the teachers' choice of strategies used in teaching chemistry in Ebonyi State. The results of this study would enable the Government, Ministry of Education and stakeholders in Education sector to manage such factors effectively and enhance the productivity of the teachers.

Purpose of the Study

The purpose of this study was to identify the factors that influence teachers choice of strategies used in teaching chemistry in secondary schools in Ebonyi State of Nigeria. Specifically this study intends to:

- Identify the factors that influence the choice of teaching strategies.
- Identify the factors that have a more pronounced influence on the choice of teaching strategies in chemistry.

Research Questions

The following research questions guided the study:

- What are the factors that influence the choice of strategies used by chemistry

teachers in teaching chemistry in secondary schools in Ebonyi State?

- What are the factors that have more pronounced influence on the choice of teaching strategies used by the chemistry teachers?

Hypotheses

The following two hypotheses were tested at 0.05 level of significance.

H₀₁: There is no significant difference between the mean of the responses made by male and female chemistry teachers on the factors that influence the choice of teaching strategies.

H₀₂: There is no significant difference in the mean of the responses by teachers in the three (3) Education zones of Ebonyi State on the factors that influence the choice of teaching strategies.

Methodology

The survey research design was adopted for the study; Area of the study is Ebonyi State. The population of the study comprised the 210 chemistry teachers in the 221 secondary schools in Ebonyi State. The distribution of the population of teachers in the three (3) Education zones of the state was as follows: Abakaliki 85, Afikpo 73 and Onueke 52

Instrumentation

The instrument used for data collection was a closed response questionnaire constructed by the researcher.

The instrument has a five point scale with options coded and rated as follows:

Rating	Lower Limit	Upper Limit
5	4.5	5.00
4	3.5	4.49
3	2.5	3.49
2	1.5	2.49
1	0.0	1.49

The instrument has a total of 25 items on the factors that influence the choice of teaching strategies. Validation of the instrument was done by three experts, one in vocational education, one in measurement and Evaluation and one in chemistry Education. The reliability of the instrument was established using Cronbach alpha after a pilot test carried out in Abia State on 150 teachers. The reliability coefficient of the instrument was found to be 0.90.

The questionnaire was administered by the researcher on all the respondents. They were returned in usable form and used for data analysis. Data analysis was done using a computer programme, the statistical analysis system (SAS) installed from SAS Institute (1994). In this system the analysis of the data for answering the two research questions was done using the mean (x). Data analysis for testing the null hypothesis 1, was done using the Z- Test statistics while hypothesis 2, was tested with one-way analysis of variance (ANOVA).

Decision Rule

The decision rule for answering the two research questions was based on real limit of numbers (Runyon and Hober, 1980 and Obi, 2009). The range of each category was used to take decision on the items. The lower limit of 4 (Agree) on the scale was 3.5 which was used as the cut-off column. The decision taken on testing the null hypothesis 1 was based on comparing the calculated Z-ratio with the level of probability at 0.05 level of significance as provided by SAS. According to SAS institute (1994), a null hypothesis was rejected and result statistically significant when the calculated Z-ratio was less than or equal to (\leq) 0.05. Otherwise the null hypothesis was not rejected and the result were said to be non significant.

The decision taken on testing the null hypothesis 2 was based on comparing the calculated probability of F with the level of probability at 0.05 and decision was taken as explained in the case of the Z- test statistics. In hypothesis 2, where significant difference was established, the Least Significant Difference (LSD) test was used to determine where the difference occurred among the three means. Where the difference between two means was less than the LSD, there was no significant difference.

Results**Research Question 1**

What are the factors that influence the choice of strategies used by chemistry teachers in teaching chemistry in secondary schools in Ebonyi State?

Data that answered this research question are presented in Table 1 below.

Table 1: Mean Rating of Teachers on the Factors that Influence the Choice of Strategies used in teaching Chemistry in Secondary Schools in Ebonyi State.

S/N	The following factors influence the choice of strategies used in teaching chemistry in my school	\bar{X} N=210	Remarks
1.	Lack of knowledge of ICT	4.10	Agreed
2.	Poor knowledge of computer Assisted instruction	3.82	Agreed
3.	Inadequate staff	4.20	Agreed
4.	School location	3.53	Agreed
5.	Gender difference	3.56	Agreed
6.	Availability of instructional materials	4.25	Agreed
7.	Class size	4.33	Agreed
8.	Class level (or level of the class)	3.50	Agreed
9.	Availability of physical facilities	4.19	Agreed
10.	Poor staff remuneration	4.05	Agreed
11.	Ineffective school administration	3.65	Agreed
12.	Professional training /qualification of teachers	4.15	Agreed
13.	Length of service /experience of the teachers	3.55	Agreed
14.	Inadequate exposure and orientation of teachers	4.01	Agreed
15.	The number of times allowed for instruction per week	4.50	Agreed
16.	The nature of the concept(Topic) being taught	4.24	Agreed
17.	The effectiveness of medium of instruction	3.54	Agreed
18.	Availability of transport facilities	3.51	Agreed
19.	Inadequate laboratory Assistants	3.58	Agreed
20.	Inadequate educational funding	4.03	Agreed
21.	School/community relationship	3.55	Agreed
22.	Participation in-service education	3.60	Agreed
23.	Attending to religious duties	3.56	Agreed
24.	Attending to other school responsibilities	3.63	Agreed
25.	Attending to community responsibilities	3.71	Agreed

The results on table 1 indicate that the means of all the factors have been rated Agreed by the chemistry teachers. This implies that all the factors influence the choice of teaching strategies used by the chemistry teachers in teaching the subject. The knowledge of the influence of these factors will necessitate the need for effective management of these factors to improve the quality of instruction in schools (Obi, 2009).

Research Question 2

What are the factors that have more pronounced influence on the choice of teaching strategies used by the chemistry teachers?

Table 2: Mean Rating of the Factors that have a more Pronounced Influence on the Choice of Teaching Strategies.

S/N	The following factors have more pronounced influence on the choice of teaching strategies	Mean X	Remarks
1.	Lack of knowledge of ICT	4.10	Agreed
2.	Inadequate Staff	4.20	Agreed
3.	Availability of instructional materials	4.25	Agreed
4.	Class size	4.33	Agreed
5.	Availability of physical facilities	4.19	Agreed
6.	Poor professional training/qualification of teachers	4.05	Agreed
7.	Professional training/qualification of teachers	4.15	Agreed
8.	Inadequate exposure/orientation of teachers	4.01	Agreed
9	The nature of the concept (topic) being taught	4.24	Agreed
10	Inadequate educational funding	4.03	Agreed

The results on table 2 show that out of the 25 factors that influence the choice of teaching strategies used by chemistry teachers in teaching the subject, ten of them including: Lack of knowledge of ICT, Inadequate staff, Availability of instructional materials, Class size, Availability of physical facilities, Poor staff remuneration, Professional training/qualification of teachers, Inadequate exposure/orientation of teachers, the nature of the concept (topic) being taught and inadequate educational funding have been rated higher than 4. This implies that they had a more pronounced influence on the choice of teaching strategies used by the chemistry teachers.

Hypothesis 1

There is no significant difference between the mean of the responses by male and female chemistry teachers on the factors that influence the choice of teaching strategies.

The Data used in testing this hypothesis are presented in table 3.

Table 3: Test of Difference between Mean Rating of Male (X_1) and Female (X_2) Chemistry Teachers on the Factors that Influence the Choice of Teaching Strategies used by the Chemistry Teachers

S/N	These factors affect the choice of strategies used in teaching chemistry	X_1 - Male Chemistry Teachers N=90	X_2 , Female Chemistry Teachers N=120	Z-Ratio	Remarks
1.	Lack of knowledge of ICT	4.01	3.52	0.01	S
2.	Poor knowledge of CAI	4.16	3.55	0.01	S
3.	Inadequate staff	4.00	4.15	0.01	S
4.	School location	3.87	4.12	0.01	S
5.	Gender difference	3.56	3.68	0.34	NS
6.	Availability of instructional materials	4.11	3.92	0.26	NS
7.	Class size	3.83	3.51	0.01	S
8.	Class level	3.56	3.70	0.32	NS
9.	Availability of physical facilities	3.97	3.81	0.03	S
10.	Poor staff remuneration	4.18	3.70	0.01	S
11.	Ineffective school administration	3.53	3.76	0.01	S
12.	Professional training /qualification of teachers	4.18	3.57	0.01	S
13.	Length of service /experience	3.68	3.64	0.01	S
14.	Inadequate exposure and orientation of teachers	3.55	3.70	0.21	NS
15.	The number of times allowed for instruction	3.82	3.57	0.33	NS
16.	The nature of the concept (Topic)	3.91	3.77	0.02	S
17.	The effectiveness of medium of instruction	3.67	3.70	0.17	NS
18.	Availability of transport facilities	4.68	4.00	0.03	S
19.	Inadequate laboratory Assistants	3.93	3.55	0.01	S

20.	Inadequate educational funding	3.72	3.62	0.02	S
21	School/community relationship	3.98	3.54	0.26	NS
22	Participation in-service education	3.54	3.60	0.17	NS
23	Attending to religious duties	3.83	3.59	0.39	NS
24	Attending to other schools responsibilities	3.55	3.50	0.11	NS
25	Attending to community responsibilities	3.97	3.89	0.49	NS

The data presented in table 3 show the results of the z-test of difference between the mean ratings of male and female chemistry teachers on the factors that influence the choice of teaching strategies used in chemistry teaching. Thirteen out of 25 factors compared had z-ratio < 0.05. The Hypotheses (H_0) is rejected. The Twelve other items compared had z-ratio of > 0.05. Therefore, the null hypothesis (H_a) is not rejected. This means that both the male and female chemistry teachers had similar ratings in those factors. This agrees with the study carried out by Obi (2009) on the choice of strategies used by Agricultural Science Teachers. He discovered that the mean rating of the male and female teachers on these factors that influence their choice were almost the same.

In this study the items that had significant difference include: Lack of knowledge of ICT, Poor knowledge of computer assisted instruction (CAI), Inadequate staff, class size, availability of physical facilities, poor staff remuneration, professional training/qualification of teachers, length of service/experience, the nature of the concept (topic) availability of transport facilities, inadequate laboratory assistant and inadequate educational funding. From this table 3, it shows that all the respondents agreed that the factors influenced their choice of use of teaching strategies. This is clearly seen from their mean ratings on those factors, the male chemistry teachers felt the impact of fifteen (15) factors on their choice of teaching strategies used in teaching chemistry more than their female colleagues. Differences in perception of these two groups of respondents concerning the influence of these factors on their choice of teaching strategies may be responsible for these observations.

Hypothesis 2

There is no significant difference in the mean of the responses by the chemistry teachers in the three (3) Education Zones of Ebonyi State on the factors that influence the choice of teaching strategies. The data used in testing this hypothesis are presented in tables 4 and 5

Table 4: ANOVA Result for Mean Rating of Chemistry Teachers in three Education Zones of Ebonyi State on the Factors that Influence their use of teaching Strategies in Chemistry.

Source	Df	Sum of square	Mean of square	F	Pr > F
Items	24	0.368796	0.015367	1.06	0.564
Zone	3	1.294354	0.431451	23.58	< 0001
		26			
Error	72 01	1.069732	0.014858		
Corrected	99	2.739193			

The data analysis of the variance table for the mean ratings of chemistry teachers in the three (3) education zones of the state is presented in table 4 above. The probability of F for the three groups < 0.05. This implies that there were significant differences in the mean ratings of the teachers in the three education zones. The inter-zonal differences in the responses of the chemistry teachers on their choice of use of strategies in teaching chemistry could be attributed to the differences in their school location, availability of physical facilities such as laboratories, libraries among others, and the environment of the school or the teachers.

Table 5: ANOVA results Comparing the Mean Rating of Teachers in the Three Education Zones of Ebonyi State on the Factors that Influence their Choice of Use of Teaching Strategies in Chemistry Instruction.

Zones	Mean
Zone 1: Abakaliki	4.4891
Zone 2: Onueke	3.8967
Zone 3: Afikpo	4.3285
Probability of F	0.01
LSD	0.055

The data on table 5 show the mean ratings of the teachers on the factors that influence the choice of teaching strategies used in teaching chemistry. Zone 2 had the lowest mean rating of 3.8967 while zones 1 and 3 had higher mean ratings, with zone 1 having the highest mean rating of 4.4891 and zone 3 had a mean rating of 4.3285. The data in this table 5 show that there was significant difference among the mean rating from the three zones. All the mean ratings ranged from 3.8967 to 4.4891. This implies that all the chemistry teachers agreed that all the factors listed in table 1 and 3 influenced their choice of use of teaching strategies in chemistry instruction.

Findings

From the data analysis as were presented in tables 1 to 5, the following were the findings of this study:

- The 25 factors studied influenced the choice of use of teaching strategies in chemistry.
- Ten of the factors had more pronounced influence on chemistry teachers than others. Such factors include: Lack of ICT knowledge, inadequate staff, Availability of instructional materials, class size, Availability of physical facilities, poor staff remuneration, professional Training/qualification of teachers, Inadequate exposure/orientation of teachers, the nature of the concept (Topic) being taught and inadequate Educational Funding.
- It was found that there were significant differences between the mean ratings of male and female chemistry teachers on twelve of the factors that influence the choice of teaching strategies used by chemistry teachers.
- There were significant differences in mean ratings of the chemistry teachers in the three education zones in Ebonyi State, with Abakaliki (State capital) having the highest mean.

Discussion

The findings from the analysis of data obtained on the factors that influence the choice of teaching strategies used by chemistry teachers were in agreement with that of Ezeji (2000) and Obi (2009) who observed the influence of similar factors on the vocational teachers work and Agricultural science teachers respectively. The significant difference observed between the responses of the male and female chemistry teachers on the factors that influence their choice of use of teaching strategies were in agreement with those of Ezeji (2000), Osinem, (2000) Obi (2009) and Omiko (2014) who observed similar gender differences in their studies. The inter-zonal difference also observed in this study were in agreement with those of Akabogu (2006) and Omiko (2011) who made similar observations in their respective studies on school location.

Conclusion

The choice of use of instructional strategies by the chemistry teachers in the three Education Zones of Ebonyi State was influenced by several economic and social factors. Many of these factors had greater influence on the choice of use of the teaching strategies than others. The knowledge of these factors will help the Ebonyi State Government and the State Ministry of Education to be aware of their effect in teaching and learning of chemistry and be able to manage their effect effectively to enhance the efficient work of the teacher.

Recommendations

From the findings of this study and their educational implications, the researcher made the following recommendations:

- The chemistry teachers and indeed all the science teachers should be encouraged to go for information communication technology training. To enable them be acquainted with the current knowledge of how to use information technology (IT) in teaching their subjects.
- More chemistry teachers should be employed to enhance the performance of students in the subject,
- Both the state Government and the Ministry of Education should build more classroom blocks and provide enough furniture and other necessary equipment in the school. This will help to reduce large class size.
- The teachers (chemistry teachers) should be encouraged to attend regular in-service training, conferences, works and seminars organized by the Government or professional bodies outside the school. This will help in upgrading the knowledge, skills and pedagogy of the chemistry teachers.
- The Ministry of Education and the Government should provide instructional materials to schools on regular basis to help the chemistry teachers in teaching the subject.
- The teachers should be paid regularly, this will motivate the teachers to work harder and to carry out their duties efficiently.

REFERENCES

1. Agbudu, O.N. (2008). Utilization of school farm for the improvement of teaching agricultural science in senior secondary schools in Benue-State, *Unpublished Ph.D Thesis*, Nsukka, University of Nigeria.
2. Akabogu, J.U (2006) Effect of school Location on student's Achievement in Reading comprehension. *International Journal of Educational Research*, 1(1) 109-114.
3. Ezeji, S.C.O. A. (2000) Relationship between Professional Training/level of Education experience and job satisfaction of Technical Teachers. *Nigerian Journal of Education and Technology* 3(1) 56-70
4. National Population Commission, Abuja (2000).
5. Njoku, Z. C. (2009). Strategies for meeting School-Based challenges in gender and STM Education: Gender and STM Education Panel No. 3. *A Publication of the Science Teachers Association of Nigeria (STAN)*.
6. Obi C.I. (2009) A study of the factors influencing the choice of strategies used in Teaching Agricultural Science in Secondary Schools in Adamawa State. *The Nigeria Journal of Research and Production* 15(2)97-106.
7. Olaitan, S. O. (2003). Understanding curriculum, Nsukka, Ndudim Printing and Publishing Co.
8. Omiko, A. (2012) The use of Information and Communication Technology in Teaching and Learning of Chemistry in Secondary Schools in Nigeria: Challenges and remedies, *Journal of Qualitative Education, Association for Encouraging (ASSEQEN)* 9(2) 113-120.
9. Omiko, A. (2011). Experimental Based-learning activities in Science, Technology and Mathematics Education. Aid to sustainable scientific Development in Nigeria. *Journal of Arts and Social Science Education. Faculty of Education, Ebonyi State University*. 2(1)30-37
10. Omiko, A. (2014). *Creativity Oriented Science and Technology Curriculum for Secondary Schools in Nigeria. Implication for skills Acquisition and National Development*. Annual Conference Proceeding of The Science Teachers Association of Nigeria (STAN) 18-23 August. In print.
11. Osinem, E. C. (2000) Personal Orientation of Agricultural Science Teachers influencing adoption of farms in Anambra State. *Nigeria Vocational Journal*, 10(1)28-32.
12. Runyon, R.P. & Hober, A (1980) Conducting Educational Research. (2nd ed) New York: Harcourt Bace Javonovic Inc.
13. Statistic Analysis system (SAS) Institute. (1994). SAS state. Users guide, version 6, 4th (ed) Larry, C. N. 675.